of minor matters which seem hardly to matter but it is submitted that the list filed is in accordance with 37 CFR 1.98(a)(1). The Examiner can initial next to the list and since the list only contains U.S. Patents there is no need to segregate out different types of information.

The Examiner goes on to object to claims 30 and 45 which have obvious minor spelling errors. The Examiner is authorized to correct those by Examiner's amendment.

102 Rejections based on the Beck Patent

The Examiner has rejected Claims 1,14,28,35,38,39 and 40 under 35 U.S.C. 102 (b) as being anticipated by Beck. Claim 1 recites a method of implanting boron ions into semiconductor materials at specified energies including providing a source of boron ion plasma where the ions or plasma originate from solid boron material and where the plasma is defined as a state of matter consisting of ionized cores and free electrons with approximate overall charge neutrally in space and streaming the ions or plasma against a target semiconductor material thereby implanting them. The Examiner rejects Claim 1 stating that "Beck discloses a method of implanting boron ions into semiconductor materials at specified energies including providing a source of boron ions or boron ion plasma where the ions or plasma originate from solid boron material, and where the plasma is defined as a state of matter in consisting of ionized cores and free electrons with approximate overall charge neutrality in space, and streaming the ions or plasma against a target semiconductor material and thereby implanting them because of

energetics suitable for penetration into the material (col. 2, lines 7-23)." This is simply not true. Beck discloses introducing a boron-oxide vapor into a conventional gas discharge ion generation source. Again, he introduces a vapor into a gas. Nowhere is it remotely suggested that ions or plasma are pulled directly from the solid, nor does he suggest that any medium (particularly a vacuum or a solid) other than the gas in involved in the actual ion generation. In the case of the instant invention, the ion source has no intermediate gas phase. Plasma is drawn directly from the solid to the vacuum which, in principle, can be as good as vacuums get. In the case of Beck, a boron-oxide vapor is another gas with different compositions that that of a basic gas source. Some of the vapor Beck produces then gets converted to plasma in the conventional gas source (glow discharge). The source is first filled with argon gas, but Beck proposes that with sufficient enrichment of boron-oxide vapor (gas) the source can readily convert over to a pure boron-oxide gas feed in some case. In the instant invention the solid boron cathode in a vacuum are source is the origin of the plasma. It appears that the Examiner has confused the instant disclosure with the Beck reference as it does not show what she says it shows and it appears that she is only quoting from claim 1 rather than Beck.

Claim 1 calls for providing a source of boron ions originating from solid boron material and streaming said ions against a target semiconductor. Beck shows no ions from a solid boron material. Claim 14, dependant upon claim 1, calls for the target being a solid silicon wafer. It contains all the limitations of claim 1.

In relation to Claim 14 the Examiner states that Beck discloses the target as a

silicon wafer. It should be noted that we are not claiming ion implementation of boron by itself as it was invented in 1954 by Nobel Prize winner William Shockley of Bell Labs. This is merely a dependant claim.

The Examiner goes on to state that referring to claim 28 Beck et al discloses a method of ion implementation of boron wherein every process including steps of providing for generation of plasma and streaming of boron ions to the target are conducted with all components in a vacuum. This is simply not true, this is not found in Beck. The Examiner is referred to the introductory material in this specification where it says:

> "Arc sources differ from other plasma sources in that the plasma is generated in an arc gap, which, otherwise, may consist of a **good vacuum**. Hence the other name 'vacuum arc'. Other ways of generating ion plasma work by introducing suitable energy (RF, microwave irradiation, hot or cold cathode electrons, etc.) to gas at somewhat low pressures, but **not a vacuum** in the sense of the **vacuum** arc source."

All of the patents mentioned by the Examiner for producing boron contain deliberately introduced and specifically named gases or a gas wherein the gas in the instant case is the medium for plasma generation. <u>This is a very important distinction. Any boron introduced is also introduced atomically or molecularly and then ionized in the gas-based plasma. Claim 28 calls for the ion implantation of boron conducted in a vacuum.</u>

The term "somewhat low pressure" as referred to above means a pressure of the deliberately introduced gas, where said pressure is invariably below atmospheric, and therefore qualifies as a partial vacuum, but not as a "vacuum in the sense of the vacuum

arc source".

The range of possible pressures involved could be over a factor of 1,000,000,000,000 but what is contemplated is an economically achievable industrial vacuum in the range of 10 to the minus sixth power torr for the instant process. Gas plasmas, as in Beck, operate at a factor of 100 to 10,000 higher in pressure of the deliberately introduced gas than does the vacuum arc source of the instant invention.

The claimed process is the only process in which both the ion generation and the delivery process take place entirely within a vacuum. Existing beam systems use ion generation in a gas, but incorporate a long beam line (to accommodate the magnet also) over which the beam has to be transported. The beam cannot be transported very far except in a vacuum. Therefore the bean line provides for differential pumping so most of the beam line and the target silicon can be in true vacuum, different from the ion source. In Beck, the process the plasma generator is gas <u>but the target is in a vacuum.</u>

When comparing the instant invention with that of Conrad, U.S. Patent No. 4,764,394, it should be noted that the instant process has neither the magnet nor the beam line separation in manifestation. Nor does it introduce impurities from the gas as does the Conrad-based process. While the Conrad based process is used for delivery of the <u>pure boron ions</u> (no gas, no gas ions, no other ions at all other than boron) impurities are not acceptable. Conrad's teachings are only used as far as polarization of the target is concerned but <u>with no gas</u> in the plasma generation.

The Examiner then goes on to state that Beck, in relation to claim 35, discloses providing the necessary cooling or attenuating the implantation rate, as desired to achieve the desired low temperature during implantation. (col, 4, lines 21-40). It is respectfully argued that no such language appears in Beck. It appears that the Examiner is confused as the words "cooling" and "attenuating" do not appear in Beck. The Examiner is reminded that this is a dependant claim and must be judged with the full measure of the independent claims upon which it depends. Claim 35, dependant upon claim 1, contains all the limitations thereof and further calls for attenuating the implantation rate.

Regarding claim 38 the Examiner states that Beck (assumedly in col 5, lines 11-12) discloses that wherein a beam or plasma may be deflected, steered, or confined by magnets or magnetic Gelds of various geometries for the purpose of containment of plasma, directing the beam to the particular target, or separation of ions from macro particles. Again it appears that the Examiner has quoted our own claim language back to us and since the rejection of base claim is not well taken and fails to anticipate, this claim likewise is not anticipated. Again, claim 38 depends upon claim 1 wherein the beam of boron ions may be deflected by magnets or magnetic fields for containing the ions or plasma.

Again on Claims 39 and 40 the Examiner recites the language of the instant claims alleging that everything claimed is shown in Beck. The claims are dependant claims and while there are arguments to be made against any such rejection as postulated by the Examiner. It should be noted that only the instant process meets the criteria of

producing boron ions and being safe. While the patent cited by the Examiner to Booske shows a safe process it is not producing boron ions. Claim 39 is a method claim for providing boron ions by beam or plasma immersion.

102 Rejections based on Booske

The Examiner has rejected claims 1-5,8-12,14-16,19,21,24,28-30,33,36-42 and 45 as anticipated by Booske under 35 U.S.C. 102 (b). Claims 1-3 contain the limitations of boron ions as does independent claim 4 calls for the plasma to consist only of boron ions. Claim 5 adds a limitation to claim 1 upon which it depends. The Examiner states that Booske shows a method of implanting boron ions into semiconductor materials at specified energies including providing a source of boron ions or boron ion plasma where the ions or plasma originate from solid boron material, and where the plasma is defined as a state of matter in consisting of ionized cores and free electrons with approximate overall charge neutrally in space and streaming the ions or plasma against a target semiconductor material and thereby implanting them because of energetics suitable for penetration into the material. The argument put forth regarding Beck also applies here as Booske does not show the same process. It is noteworthy to look at the claims of Booske which summarize his invention.

Claim 1

A method for fabricating ultra shallow junction semiconductor devices, comprising the steps of :

(a) depositing a thin film of a boron containing dopant from a solid source of the boron containing dopant onto a surface of a silicon based semiconductor substrate

(b) Surrounding the substrate surface with a plasma of *ions* generated from a *non-reactive gas*,

(c) accelerating the *ions* from the *plasma* toward the substrate surface at an ion energy sufficient to impact the film of boron containing dopant and drive boron atoms from the dopant into the substrate to dope the substrate,

(d) depositing a thin film of phosphorous from a solid source of phosphorous unto the surface of the semiconductor substrate,

(e) surrounding the substrate surface with a second plasma of *ions* generated from *a non-reactive gas*, and

(f) accelerating ions from the second plasma toward the substrate surface at an ion energy sufficient to impact the film of phosphorous and drive phosphorous atoms from the film into the substrate.

Certain key words are italicized and underlined as they show that the plasma consists of ions of non-reactive gas, not boron ions. Ions accelerated toward the surface are from the non-reactive gas meaning inert gas such as argon. The "dopant" is a thin layer of elemental boron (atoms) for which the boron has been sputter deposited from a solid boron source which is a "sputter target" (col 4, lines 25-30) . This sputter target is a source of boron atoms upon sputtering , but is not, nor is it claimed by Booske, to be a source of boron ions. Ionization and acceleration of boron ions do not play a role in the process. The boron is "deposited" as a thin layer. Then it is "driven in" as Booske describes, by bombardment with ions from the gas-based plasma. Ionization and acceleration of boron ions play no role here. Applicant was well aware of Booske and listed it as background art.

The Examiner's comments relative to claims 2 and 3 are not well taken as the features are not shown in Booske. It appears again to merely be the instant claim

language repeated as a rejection.

In regard to claim 5 the Examiner's comments are incorrect as Booske produces no boron ions whatsoever. While Booske refers to boron "dopant" they are merely sputtered atoms, not ions. There is a difference.

With regard to the Examiner's comments relative to claims 8,9,10,11,12,14,15,16,19,21,24,28,29,30,33,36,37,38,39,40,41,42,43,44 and 45 the same arguments as noted above with respect to Booske apply. Claim 8 depends on claim 2 which in turn depends on claim 1 which has a recitation of boron ions. Claim 9 contains a rectitation of streaming boron ions. Claims 10 to 16 all depend upon claim 1 and contain further limitations on the process of claim 1. Since Booske has no boron ions it has no application to these claims. The same applies to claims 19 and 21. With respect to claim 9 Booske makes no reference to "boron ion" current. It has a zero boron ion current as it has <u>no boron ions</u>. With respect to claim 12 gas sources such as Booske do not make macroparticles which is a problem unique to vacuum arc sources which obtain ions directly from the solid. With respect to claims 15 and 16 it should be noted that Examiner refers to use of graphite, CVD diamond or other silicon. She suggests that this anticipates the instant inventions use of semiconductor diamond material and silicon carbide semiconductor materials as <u>target materials</u> or <u>subjects of treatment</u>. There is no such anticipation in Booske.

It should be noted that the Booske patent discloses a system which will not work. As is well known, the issue of sputter contamination is already an important processing issue in ion implantation in general. Due to its low atomic mass and refractory qualities,

boron is hard to sputter. It tends to sputter less than anything else in the system. In the face of that fact, Booske proposes to use a boron sputter target which will be much smaller in area than the rest of the system to achieve his thin coating. If the system chamber is of the standard stainless steel construction, his system will sputter more steel than boron. Booske needs these coatings for the inside of the chamber to prevent total sputtering onto the silicon wafer and for which any atoms sputtered (silicon, carbon, etc.) might be more acceptable to the target. This is only one of several reasons why the Booske process is unlikely to work. Booske has had no reduction to practice of his invention, unlike the instant invention, and has not proven absolute incorporation of boron into the silicon target with almost no sputter contamination from the walls. The instant system, using only boron ions, which eliminate unwanted sputter contamination. The instant system shows a successful reduction to practice (see the article of the inventor hereof, J. M. Williams, et al, *Nuclear Inst. Methods in Physics Research*, 2005, pages 278-283.)

In regard to claim 19, nowhere does Booske mention boron ions so the Examiners statement is not accurate.

With regard to claims 21, 24 (both dependant upon claim 2) and 28, an independent claim, it is noted that the Booske reference uses a gas source, not a vacuum source. Again, the Booske reference mentions non-reactive gases such as argon which is not used in the instant invention.

In rejecting claim 29, dependant upon claim 28, the Examiner again quotes the

language of the claim back as if the Booske reference shows the limitations. She states that the vacuum precludes introduction of any non-solid matter, in particular gaseous matter, other than the plasma and the ions originating in the solid electrode. This is incorrect but it is worth noting that the whole argument concerning the terms vacuum and vacuum arc source apparently is creating confusion on the part of the Examiner. The term "vacuum" as used in this application precludes introduction of any non-solid matter, in particular, gaseous matter, etc. Absolutely all the ion sources cited by the Examiner involve the introduction of gaseous matter in violation of this definition, and none draw boron plasma directly from the solid boron to the vacuum, as does the instant process.

In regard to claim 30, dependant upon claim 1, the Examiner continues the mantra of merely citing the claim language and asserting, incorrectly, that one finds it all in the reference. Again, for the ion source involved in this invention, NO GAS is needed for the ion source to perform its intended main function or boron ion implantation. The ion sources in the references have to have gases that are particularly suited to their respective needs.

In regard to independent claim 33, dependant claim 36, independent claim 37, dependant claim 38 and independent claim 39 it is noted that none of the limitations appear in Booske, namely boron ions and a vacuum.. Booske absolutely does not teach anything even remotely related to the limitations of claim 36. Claims 37, 38 and 39 are erroneously attributed to Beck by the Examiner as Booske has no magnetic separation.

Finally we have claims 40, 41, 42, 43, 44 and 45 which are rejected over Booske.

The same reasons noted in the discussions of the previous claims apply to the rejection of these claims. It is noted that the argument pertaining to Claim 1 applies here likewise as all of these claims depend on claim 1.

102 Rejections based on the Obara Patent

It should be noted that this reference is totally irrelevant to the instant invention. Obara does not involve an ion source of any kind, gas, solid, arc or otherwise. It is a heat process in which boron atoms are evaporated from a solid source (could be boron) by use of laser heating to deposit condensed dopant vapor on the silicon surface. The dopant can then be diffused in and activated by further laser treatment of the target. Obara makes no ions. He only uses the word "ion" when comparing his process to the competitive "ion implantation" or to describe application of his process to wafers already processed by the controversial "smart cut" ion implantation process. His use of the term implanting is in the abstract which is to imply he gets the same results as "ion implanting".

The Examiner has rejected claims 1, 2, 4, 14, 22, 34, and 37 over Obara. Again she continues to paraphrase the instant claim language and incorrectly assert that it is all found in the reference. There is no substantive argument in any of these rejections. Unlike the instant invention, Obara uses laser heating as the main processing tool with regard to claim 34.

102 Rejection over the Goldberg patent

The Examiner has rejected claim 5 under 35 USC 102 over Goldberg. The

Goldberg invention used BF3 gas (from cylinder 20 in the drawing) and decarborane gas (produced by evaporation at 30 in the drawing) in contrast to the instant inventions use of a vacuum and the absence of gas.

Goldberg does not claim nor achieve 100% ionization of the boron and the plasma will contain molecular ions, fluorine ions and hydrogen ions from cracked gas atoms in contrast to the instant inventions totally pure boron ions. See the Foad reference for an explanation of the gas cracking process.

The instant invention does not employ a magnet, such as component 16 in Goldberg and neither does the instant invention contemplate separating boron from other atoms and molecules by a magnet as the ions are pure.

103 Rejections over Booske in view of Foad

The Examiner has rejected claims 6, 7, 13, 18, 20, 25-27 and 32 over Booske in view of Foad under 35 USC 103. For all the reasons stated in the discussion of the 102 rejections based on Booske these rejections are not well taken. The Examiner relies on Foad to show a two-electrode vacuum arc system aka as a cathodic arc system stimulated by a laser. The arguments of the Examiner on pages 13 and 14 are misleading and, at times, indecipherable as to intent.

There is a huge fundamental difference between the source of the instant invention, the "vacuum arc" and all the other ion sources invoked by the Examiner or, in fact, anything presently in use in the semiconductor industry today. All of the other ion

sources use gas as the precursor medium and all are in the broad class of "glow discharge" sources. The instant source is an arc source. While arc sources have been used elsewhere in industry for coatings, they have never been employed as ion sources for ion implantation in the semiconductor industry. The difference between an arc source and a glow discharge source can be conceptualized as similar to the difference between a fluorescent light bulb and a welding arc. Actual welding arcs usually operate at atmosphere but could operate in a vacuum. Arcs are too bright to gaze upon with the naked eye. Arcs primarily consist of about 100 amps of pure electron current and only 1 or 2% of that as ion current which means 1 or 2 amps. Glow discharge sources typically produce much less ion current than an arc source. A glow discharge source or an assemblage of glow discharge sources that would produce a total of 1 or 2 amps or ion current could literally be as large as a railroad boxcar with attendant pumps needed to move the gas at the necessary low pressures. A chart of the major differences between the instant invention and the various gas discharge devices cited by the Examiner attached hereto as Appendix A. The chart dramatically distinguishes between the references and the instant invention in many areas.

The factors shown in the Appendix A dictate system design and are different for the two types of sources. While some, such as Foad, call glow discharge plasma chambers "arc chambers" it is a misnomer. They are not really arcs at all nor are they "vacuum arcs". They obviously rely on gas feed.

103 Rejection over Booske in view of Protic

The Examiner has rejected claim 17 over Booske in view of Protic under 35 USC

103. The same arguments apply with regard to Booske as have been argued above. As Booske shows no ability as a "teaching reference" the application of Protic in combination must fail.

103 Rejection over Booske in view of Goldberg

The examiner has rejected claim 23 over Booske in view of Goldberg under 35 USC 103. As both references have been discussed and shown to be misapplied to the claims no further discussion is necessary.

General Discussion of the Claims and the Rejections

The Examiner seems to be suggesting that Booske somehow anticipates Foad in her comments bringing us to a defense of Foad. The two references are absolutely unrelated. While they both have the same goal of producing chips, Booske does not produce boron ions. Foads goal is to enhance boron ion production in what is already a boron ion source based on BF3 gas.

While Foad, Goldberg and Beck are somewhat related, there is no connection to Booske for any of them. The Examiner's fictitious "one of ordinary skill in the art" would not look to the three references to modify Booske, nor is there any suggestion in Booske to do.so....there is not "problem" that one of these other references would solve. I.e., there is no "teaching" of combination. There is nothing of relevance at col 1, lines

53-57 in either patent. Neither patent mentions a "plume" or an "external electron gun". Both make use of (internal) hot-filament electrons being injected into their respective gases to fire their respective plasmas. These are standard plasma generation techniques and are not separate inventions. The electron excitation or firing of plasmas is the minimum necessary to get the plasma going at all. It does NOT provide for any enhancement or particular "high wafer processing speed" .

The ions delivered to the target are always positive ions. Depending on photoresists on the target, grounding and cooling techniques, properties of the wafer, etc., positive charges can build up on the water, and these often need to be neutralized. Therefore, on the target end, many factory systems have an electron gun to spray electrons on the wafer to keep it neutralized. This technique has absolutely nothing to do with boron ion generation.

The Foad and Goldberg references show great similiarities between the flow diagrams of Foad (Fig. 1) and Goldberg's single figure (with the magnet coincidentally labeled as 16 in both diagrams). These diagrams are representative of prevailing commercial systems.

The core ion source in Foad, consisting of components 30 through 37, is NOT part of the invention. This is known as a "White" or "Bernas" ion source chamber. It is based on a previous design known as the "Freeman" source. The instant inventor is a friend of Freeman and has served on an international committee with Bernas. The improvement comprising the Foad invention consists of the furnace for evaporation of boron into the BF3 gas plasma (comprising components 39 through 60) for additional

boron in the plasma, together with the operation and specification of chemistry. For Goldberg, it is exactly the same concept but for decarborane feed material in the furnace (it should be noted that decarborane is one of the most dangerous gases known and its actual use would pose tremendous safety and regulatory issues far beyond BF3.) Physically these ion sources are rather small compared to the rest of the beam system, as suggested in Fig. 1, of Foad. The distance from the ion source at 13 to the wafer 22 is several feet. Several pumping stations (not shown) are needed to remove drifting gas from the ion source and allow implantation of the wafer in a vacuum.

The boron furnace add-on components 39-60 arrangement is quite similar to one previously used by the present inventor and referenced above for producing thin layers of boron. It is testimony to the importance of boron ions in the semiconductor industry that this incremental improvement is worth a patent. Contrast that with the "quantum leap" of the instant invention.

Target 22 is exposed only to isotopically pure boron ions because of the combination of mass analysis provided by the magnet 16 and the gas pumping. Dimentions of the ion source are about 4 cm for the extraction slit 38 and 8 cm top to bottom of the page. The plasma density is toward the high end of the range suggested under "Glow Discharge Sources" in the Appendix. That is the volume of just a few cubic inches in the so-called "arc chamber" (which, incidentally, does not contain an arc).

During his tenure with the Office of Naval Research Labs ("ORNL") the instant

inventor designed an "arc chamber" similar to that depicted by Foad, for which quite a few hundred examples were procured by ORNL over the years and several hundred more were procured by other government laboratories.

It should be noted that boron is only one element. It should be noted that, taking into account the entire periodic table of ion species, many recipes, such as those of Foad and Goldberg, exist and are passed around in the field for generation of ions of various elements. There may be hundreds of these recipes used in the area of research. They all involve some combination of heat, solid feed materials, sputtering, different feed gases, different chemistry, etc. They are seldom patented but passed around for open use in a collegial manner. The instant inventor has developed several of these himself in addition to having used both evaporated and sputtered boron in conjunction with the gas sources. The instant invention, of using the vacuum arc ion source for the doping process is a major leap forward, well above the level of various minor techniques and not obvious at all in the research area. These previous manifestations and permutations may all well be within the "knowledge of one of ordinary skill in the art" but the instant invention is a major breakthrough. One wonders if there is anyone of ordinary skill in this highly scientific and demanding field.

In contrast to the system of the Bernas source, the Bookse system is based on a large metal bell jar of some feet in diameter and height. Plasma (together with the precursor inert gas supplied by the gas source, 28) fills the entire space. The target wafer 20 is contained within the same space and therefore is "immersed" in the plasma. The plasma density is on the low side of values suggested by the Appendix table under

"Glow Discharge Sources". Using an electron gun, Booske does sputter or evaporate (not clear!) boron atoms from a boron source subassembly (43-46, including the solid boron) onto the surface of the target 20. He then proposes to "drive in" the boron atoms by bombardment with gas ions from the surrounding space. The gas ions derive energy through the "sheath" of the plasma as they approach the target because of polarization of the target. The electron gun used to sputter or evaporate the boron atoms does not enhance or speed up any process. It is the minimum necessary to get some boron atoms. The boron atoms may be driven in ballistically, but they are not "ion implanted". Only the gas ions are ion implanted. Note that in claim 1, part c, column 14, Booske describes the process of "accelerating the ions from the plasma towards the substrate surface with sufficient energy to impact the film of boron....etc." Nowhere does he remotely suggest or imply that the accelerated ions are boron ions as so often quoted by the Examiner. They are, instead, clearly the "non-reactive" gas ions mentioned in the previous section (b).

Summary

The foregoing analysis and explanation of the various references and combinations there cited by the Examiner do not amount to either an (1) anticipation of the claims or (2) a rendering of the combinations therein as obvious. This is due to the fact that the Examiner has misinterpreted the cited art which is different from the instant invention and cannot achieve the claimed process recited herein. This misinterpretation continues throughout the entire Office action with all the references cited.

It appears that the Examiner's misinterpretation is due to a lack of understanding

of this very complex art. The undersigned with certainly grant that this art is difficult to understand and to fashion a comprehensive knowledge of. Rather than continue to waste both the inventor's time and the Examiner's time, it is suggested that a physical interview be arranged wherein the inventor can discuss these points with the Examiner in a one-on-one discussion with the undersigned present. The undersigned believes this is the classic case of where an interview can assist both the applicant and the Patent Office in reaching understanding of the issues involved.

The inventor is a very distinguished individual having an early career in nuclear reactor materials and since then has been at the Oak Ridge National Laboratory in Tennessee. He is the author of some 90 refereed papers in the field of doping with ion sources. He was chairman of the Tenth International Conference of Ion Implantation of Metals held in 1997. The material in this application also appears in the fall of 2004 at Ion Implantation Technology, *Nuclear Inst. Methods in Physics Research* (2005), pages 278-283. He is well acquainted with most of the inventors cited by the Examiner in the the art used by her and has physically seen most of the cited art.

It is therefore suggested that the Examiner, upon reaching this response for action, contact the undersigned at his Northern Virginia Office (703 754-1860 , jhiney@teklaw2000.com) and allow for the parties to set up an interview at the earliest possible time convenient to all. While there may be minor changes that can be made in the claims to more clearly illustrate the differences between the instant invention and the cited art, it should wait on an interview so that all parties have a clear understanding of the issues and such amendments are more meaningful when agreed to in the clear light of

mutual understanding.

The undersigned will await the Examiners call or e-mail to set up the interview.

Submitted herewith is a Request for Extension of Time in Which to Respond together with a check for Two Hundred and Twenty-Five Dollars ($225.00US) which reflects the additional time of two months over and above the three month statutory period which ran from July 13th to October 13th, 2005.

Should there be any other matter the Office is respectfully requested to call the undersigned at the above number.

Respectfully submitted,

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Certification of Mailing

I, James W. Hiney, do hereby certify that an executed copy of this letter together with the enclosures, was deposited, Express Mail Postage Prepaid, No. EQ 047681624 US, with the U. S. Postal Service this 13th day of December, 2005.

James W. Hiney

Appendix A

TABLE: Feature Comparison of Arc and Gas Glow Discharge Plasma Sources.

Feature	Arc	Gas Glow Discharge
No. of inventions in semiconductor industry	1, (the present)	all others
Routine boron ion current production	300 mA	6 mA
Plasma density in generation space	10^{18} to 10^{20} ions/cm^3	10^8 to 10^{12} ions/cm^3
percentage ionization	100	2
Vacuum	yes	no
Plasma emerges as "plume" or homogeneous in body of gas	plume	rather homogeneous in plasma space
Solid boron ion source	always	never
Solid boron atom source	no atoms	sometimes
Gas boron ion source	never	usually (BF_3, decaborane, etc.)
Some gas, active boron-containing and other, inert etc.	never required	always
Gas separation, ion species separation needed	no	yes
Macroparticle filtering needed	yes	no
Method 1, beam delivery	yes	yes
Method 2, plasma immersion delivery per Conrad (4,764,394)	yes	Claimed but not yet commercial
Plasma pulse fired	usually, method 1 or 2	not usually either method
Ion extraction pulse fired	usually	not usually for method 1, usually for method 2